SCIENCE

VOL. 76 FRIDAY, OCTOBER 14, 1932 NO. 1972

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SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. MCKEEN CATTELL and published every Friday by

THE SCIENCE PRESS

New York City: Grand Central Terminal

Lancaster, Pa. Garrison, N. Y.

Annual Subscription, $6.00 Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary, in the Smithsonian Institution Building, Washington, D. C.

THE IMPORTANCE OF CLINICAL PATHOLOGY TO MODERN MEDICINE[1]

By Dr. THOMAS B. MAGATH

SECTION ON CLINICAL PATHOLOGY, THE MAYO CLINIC, ROCHESTER, MINNESOTA

BEFORE an audience composed of members and friends of the American Society of Clinical Pathologists, it would indeed be like carrying "owls to Athens" to pay a tribute to the subject of clinical pathology. In this day and time one may take for granted that all realize and appreciate somewhat the value of clinical pathology to the science of medicine. The subject which will be taught in these magnificent laboratories erected by the Louisiana State University is not only important to medicine but is at least of sufficient importance to mankind to have justified the expenditure of the large sum it represents to provide suitable rooms for the courses of study that will be given here.

[1] Read at the dedication of the new clinical pathological laboratory of the Medical Center of the Louisiana State University and Charity Hospital, New Orleans, Louisiana, May 9, 1932.

At the outset one must make clear what is meant by clinical pathology, for even now divergent ideas are held as to the limits of the field.

From time to time some difference of opinion arises among laboratory men as to the definition of "clinical pathologist" as distinct from "pathologist," or shall we say, "common pathologist." No one has furnished us with a satisfactory distinction between these specialists, which leads one to suspect that they belong to the same brood, and for my part I am quite willing to include in this brood any one with a medical degree, whose subsequent training and practice make him proficient in any medical laboratory specialty. Every one who studies or investigates materials derived from patients deals with clinical material, and if he be qualified in any of the several fields of pathology he is a clinical pathologist. Therefore, what I have to

say relative to the importance of clinical pathology to modern science includes the activities carried on in the whole medical laboratory, which can not with logic be subdivided, although it does not follow that any single individual can be proficient in all the departments of clinical pathology.

Laboratory medicine has not always been in the favorable position where one finds it to-day, and in America this position has but recently been reached. Altogether, its whole history in this country may be dated within a century. In fact, one can hardly claim a century of life for the subject of pathology in the United States. The first text written for American students was that of William Edmonds Horner, an adjunct professor of anatomy at the University of Pennsylvania, published in 1829 under the title "Treatise on Pathological Anatomy." Prior to this time pathology was purely a speculative subject in this country, and but little of the science had filtered in from Germany and France. The more progressive physicians of the day naturally turned to the anatomists for help, for it was they who had especial knowledge of histology and what little was known of morbid changes. Horner was a man of keen insight. As a young man he clearly foresaw that pathology was destined to become the basis of scientific medicine, and he set about to acquaint himself with the knowledge of the time. He journeyed to Europe and studied in the French hospitals, where he was greatly impressed with the schools of Bichat and Broussais. He brought back their ideas to America and lived long enough to see some of the fables of medicine and surgery give way to the truths of his science. It was ten years before another book appeared on the subject, and that one, "Elements of Pathological Anatomy," by Samuel Gross, remained for many years the standard text. Still, several decades passed before journals devoted to laboratory subjects in medicine made their appearance in America.

But this early development of laboratory medicine did little directly to advance diagnosis in medicine, although it greatly clarified disease entities. For the most part, material was obtained at the necropsy table. The little advance that had been made up to 1891 may be learned by recalling that when the late Dr. Warthin began his career, slightly more than forty years ago, he was dependent on Vienna for most of his material for the teaching of students, and as late as 1895 he performed only twelve post-mortem examinations in that year at Ann Arbor, Michigan.

A fresh stimulus was given to laboratory medicine in 1896, when the first text in clinical pathology was published in this country, by Dr. Charles E. Simon, under the title, "A Manual of Clinical Diagnosis by Means of Microscopical and Chemical Methods for Students, Hospital Physicians and Practitioners." This book definitely outlined laboratory methods which could be used before the patient died and chanced to fall into the hands of the then pathologist of that day. The importance of this book can be readily realized when one remembers that at that time there were practically no journals, except those published in foreign countries, devoted to laboratory procedures.

From this meager origin, clinical pathology has grown until to-day texts dealing with the subject have been published at the rate of one a month for several years. The number of journals has increased until now there are in excess of 200 devoting practically their entire space to laboratory medical subjects, and hundreds of others frequently publish papers dealing with clinical pathology.

These facts alone should leave no one in doubt as to the importance of the subject and the interest taken in it, but, as more concrete evidence of its place in the sun, let us recall the fact that last year the American Medical Association, in a survey of laboratories, found 1,080, and while it is true that but 161 could be approved, the fact that so many laboratories even exist in a way indicates their necessity.

In spite of all this development of clinical pathology, and the obvious advances made in the knowledge of medicine through its avenues, there are still those who would assign to pathology a place among the classics, saying that it is a cultural pastime for the "highbrows and long-haired professors," but one not to be ranked with the general fields of medicine or surgery or with any of the specialties growing out of these so-called more practical and humanitarian subjects. This peculiar view-point exhibits itself in many ways, but curiously enough in the requirements for advanced degrees in medical subjects. In some universities, to obtain an advanced degree specified in medicine or surgery or their specialties, one must spend at least three years in attendance, while for a degree in pathology or one of its specialties but one term of nine months is sufficient. Imagine, if you can, certifying to the proficiency of a student after nine months of study in pathology, by granting him an advanced degree! In that length of time he could hardly learn just how little he knew of the subject!

The question may reasonably be asked, then, how long will it take one to gain a satisfactory knowledge of pathology? The answer to this question may shed some light on the relation of the subject to medicine in general. Unfortunately, by the very nature of the matter, no specific answer can be made, since so much depends on the mentality of the student, on his previ-

ous training, on the institution in which he received his instruction, and on the material available to him. However, the American Society of Clinical Pathologists has rightfully designated an arbitrary minimal time as being three years, and this has been accepted by the American Medical Association. How small this minimum is may be realized by considering that the dictionary still defines a pathologist as "one skilled in the science treating of diseases, their nature, causes, progress, results, et cetera." And if this be an approximately correct definition of the field of a pathologist, not only does the length of time necessary for his training become obviously long, but his importance, and therefore the importance of his field as related to all other fields of medicine, also becomes a foregone conclusion.

But a laboratory man should be willing to submit his premise to the test-tube, just as he demands of the material he collects from the patient. Therefore, rather than deal in generalities, I wish specifically to analyze a few of the many pieces of evidence that could be used to substantiate the claim that clinical pathology and laboratory methods are not only useful but important and even necessary in modern medicine.

At once I grant that during the last decade, in many places and under many conditions, clinicians have forgotten to use their own powers of observation, and have made use of the laboratory, even to a ridiculous extent. Some physicians have been accused of ordering electrocardiograms in order to count the pulse rate.

As laboratory men, we can all agree that clinicians have neglected to develop their own powers of observation, but the laboratory and its directors have served time and time again to aid the physician by carefully verifying his observations with instruments, and by application of methods of precision, so that in the end the clinician has realized his own limitation, a very much worth-while result. An interesting example of this is the fact that, although clinicians have scientifically studied the signs of pregnancy for more than 5,000 years, recently devised, simple laboratory tests can detect pregnancy earlier and more accurately than any set of clinical observations yet perfected. It would be interesting to speculate on how well a pathologist, trained to appreciate minute quantities and to observe extremely small differences in things, would be able to practice the art of medicine, but that is another matter.

It would be hazardous to single out some particular subject in laboratory medicine and to say that it was the most important contribution of this science, but one certainly would be safe in saying that the development of procedures for guarding the public health has been of sufficient importance in human affairs to have justified all the energy and money put into the whole development of clinical pathology.

In public health work the clinical pathologist has reigned supreme, basing his fight on a solid foundation of bacteriology, chemistry and pathology. The very nature of the diseases concerned, their causes and transmission, their specific treatment and prevention, has been developed by men and women who, under my definition, were clinical pathologists. Here in the South, where typhoid fever, malaria, hookworm, dengue, amebiasis and endemic typhus fever exist, and where but a short time ago yellow fever flourished, one can well pay tribute to such clinical pathologists as Bass, Johns, D'Aunoy and Craig, to say nothing of those who before their time began the campaign that has made the tropics and the subtropics a place fit and pleasant in which to live.

But it is not necessary to confine one's observations to the South in this matter. One need only consider the fall in incidence and death rate everywhere, of typhoid fever, tuberculosis, diphtheria, scarlet fever and rabies, or the present attack being made on influenza and poliomyelitis, and one will find in the thick of the fray the clinical pathologists, trained in the fundamentals of their science, freed of the necessity of pleasing a fastidious clientele, hammering away at the unknowns in the problems.

The endeavors of the pathologists in matters of public health have not been confined to human beings, but have made it possible to control and eradicate many diseases of domestic animals, and have furnished some fundamental methods of attack on the problems related to the health of wild animals.

These matters are all well known and have been appreciated for years by the laity, although many do not realize that it has been the laboratory man who has been mostly responsible for the results. There are other more specific things that have been developed by clinical pathologists which are applicable to the individual patient.

Let us take, for example, the development of serologic tests for syphilis. Is there a clinician, however expert, who can diagnose with even a rough approximation of accuracy this protean disease without the aid of the laboratory? Is it possible intelligently to give treatment in such cases without repeated examinations by the clinical pathologist? The answer is so apparent that the matter for discussion now is not whether serologic tests should be employed, but what kind of tests should be employed, and here again the pathologist must answer the question.

It should hardly seem necessary to refer to the practical and important contribution of pathology to the

diagnosis and treatment of surgical cases. Modern surgeons do not think of considering a diagnosis of tissue as final until a competent pathologist has passed on it, and the injustice the surgeon would do his patient if he failed to take advantage of such consultation would not only be a reflection on his own judgment but might result in a judgment against him in civil court. The diagnosis of tissues obtained at operation, and the diagnosis of tissues obtained at necropsy, have furnished the entering wedge, which, hammered in by the bacteriologists and chemists, is gradually pushing into the yet unsolvable question of cancer. This is probably the laboratory man's greatest problem to-day, and the solving of it must, by the very nature of the disease, be undertaken by him.

As an adjunct to the field of medicine, the laboratory has not only aided in diagnosis, prognosis and treatment, but has been so important that one may say without fear of contradiction that modern medicine could not have developed without it. A great deal of value in the laboratory has been missed by the clinician, who has looked on it as the place where some remote person is able to perform "tests" with a positive or negative result. If the clinician will view the laboratory as a place where one may detect and measure the degree of certain varying reactions of the body to stimuli, the true worth of the so-called "tests" will become more apparent. The importance of the clinical pathologist is not so much that he makes diagnoses, although he often does, but that he gathers facts which, when fitted into the general picture, help to portray the true condition.

But one could go on indefinitely in listing the importance, indeed the absolute necessity, of clinical pathology to modern medicine. One could point out the brilliant results which have been achieved in hematology, where we are beginning to see more clearly than ever before the nature of obscure diseases, unfathomable to any but the keenest observers who have devoted their whole energies to such studies in the laboratory. One could stress the necessity of numerous checks on operating room procedures made by skilled bacteriologists or the importance of identification of various bacteria and animal parasites that make their homes in our bodies. Even the elemental fact of the presence of leukocytosis or albuminuria can not be learned unless the laboratory is employed, and if it is not in the hands of a skilled pathologist, what havoc can be wrought!

But there is a greater contribution that the laboratory has made to modern medicine than the wholly practically things I have mentioned. It is the stimulus it has given to explore the unknown, to reach out beyond whatever was known at the time. It is the imagination, grounded in specific, fundamental knowledge, which clinical pathology has given to medicine, that has been its greatest gift. This stimulus has not been confined to the practitioner alone, but has affected the thousands of students passing through the universities, who, catching a spark of fire from the altar of pathology, have gone out inspired to observe more closely and to record for mankind. The laboratory has furnished superior opportunities not only to study the relation of the unknown to the individual patient but to the general sciences which underlie every phase of medical science.

It is with the hope and knowledge that this stimulus to discover the unknown will be preserved and nourished here in New Orleans, that this building was erected and that it is being dedicated in accordance with the conviction of Jean Cruveilhier that a physician without a knowledge of pathology could, indeed, be ever so skilful in practice, but, although he might see many patients, he would see no diseases.

THE TREATMENT OF ELECTRICITY FROM A LOGICAL RATHER THAN HISTORICAL STANDPOINT[1]

By Professor ANTHONY ZELENY

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THE historical method of presenting the subject of electricity has some advantages, in that the subject is expounded in the order in which it evolved. Each new field of the subject has its own mystery, in the unfolding of which there is a certain natural logic. The history connected with each field increases the cultural value of the course and adds interest through its human touch. It is, therefore, not the historical order as such that causes the dissatisfaction with the presentation of the subject but rather the facts that the different fields are not properly coordinated and that each set of phenomena is separately described and not explained in terms of basic phenomena which underlie the whole subject. There are even apparent contradictions: a magnetic field is ordinarily considered to be inseparably associated with an electric

[1] A paper read before the American Association of Physics Teachers, New Orleans, on December 31, 1931.

field only in electromagnetic waves, whereas no such association is invoked in the case of magnetic fields about currents and magnets. An electromotive force is induced by magnetic flux cutting a wire; but in a transformer, the changing magnetic flux within the core is assumed, in some mysterious manner, to perform that invaluable function without cutting the wires. Something is wrong in the exposition of the subject when it does not even attempt to give a direct explanation of the electromotive force induced in a wire cutting magnetic flux. Mathematical equations giving quantitative relationships without rational concepts do not and can never fully satisfy. These facts, together with the great loss of time involved, I believe, rather than recent physical discoveries which could be injected into the old structure if necessary, are the chief reasons for the imminent complete downfall of the historical method.

The logical presentation here outlined attempts to completely coordinate the well-established major phenomena in electricity and magnetism and explains them in terms of only the two most basic observations on electric and magnetic forces. This presentation assumes the elemental charge and its electric field to be inseparable; in fact, the charge and the field are treated as aspects of one and the same physical entity. Superposed elemental fields, therefore, in freely interpenetrating, retain their individual identities. An uncharged body then is surrounded by the individual electric fields of all its electrons and protons. For the purpose of analysis it is convenient to consider the resultant proton and electron fields separately. An electric charge, whether at rest or in motion, in these superposed electron and proton fields is acted on by no effective force. However, when the electron field is in motion in conjunction with its associated uniform electron flow, although a charge at rest still feels no force, a charge in motion, and due to that motion alone, is acted on by a definite (magnetic) force. This is considered the basic observation on magnetic forces. A magnetic field, therefore, is definitely pictured as a quality of a moving electric field, which quality is possessed by virtue of the field motion. The electric charges with their fields and this observation on magnetic forces are the two basic phenomena in terms of which the major phenomena of electricity and magnetism are definitely explained. The concept of the magnetic line of force is derived from the known directions of the magnetic forces acting between moving electrons in a magnetic loop and a wire carrying a current. The known directions of the magnetic forces and the determined directions of the magnetic fields about wires carrying currents give the law for electromagnetic reaction.

Under such a treatment, for example, each electron of a wire moving in a magnetic field has its individual magnetic field. The direction and magnitude of the force acting on the electron are known and the e.m.f. generated in the circuit explained in terms of physical concepts.

Electromagnetic induction, due to a changing intensity of a current, is explained by assuming the electric field to have inertia. The negative field about the wire is distorted by the acceleration, and a component of this distorted portion, being at right angles to the opposing proton field, is not neutralized. A cylindrical effective electric field is formed in this manner about the wire. The distorted portion which contains this field moves outward with the velocity of light and in its path gives to the yet stationary part of the negative field the velocity of the accelerating electrons. Between the distorted portion and the wire, therefore, the electron field is in motion and has the quality which we call the magnetic field about the wire. The distorted portion itself is the electromagnetic pulse, which accounts for induction and electromagnetic waves.

In order to account for the intensity of the magnetic field about a coil of wire, it is necessary to assume the elemental fields to move as expected with their lines of force always parallel to themselves. This must also be the assumption in order to show that $H = \frac{[vF]}{c}$.

The assumption of the elemental electric field, having inertia, as basic, and the attributing of the magnetic field definitely to a quality of the electric field in motion, in conjunction with the concept of superposed fields and the conservation of energy, enables all the major phenomena in electricity and magnetism to be clearly coordinated in a satisfying, logical manner.

OBITUARY

OUTRAM BANGS

OUTRAM BANGS, curator of birds at the Museum of Comparative Zoology, Cambridge, Massachusetts, and one of the foremost ornithologists of the day, died at his summer home at Wareham, Massachusetts, on September 22, 1932, after an illness of two weeks.

Bangs was born in Watertown, Massachusetts, on January 12, 1863, the son of Edward and Annie Outram (Hodgkinson) Bangs. He attended Noble's School in Boston and later Harvard University,

graduating from the Lawrence Scientific School in 1884.

From earliest youth he displayed a great love of nature, which led him out into the woods and fields on all occasions; he had learned to shoot and to prepare specimens by the time that he was twelve years old, and the amassing of a collection of birds thus began long before entering college. After graduation, a brief experience in a business office convinced him that he would be much happier following his natural bent. Fortunately, he was not obliged to work for a livelihood, so he was free to devote his entire time to systematic zoology. He immediately plunged into the field of mammalogy, and remained thus engrossed until the latter years of the last century. He collected mammals extensively in New England, the Maritime Provinces, Georgia and Florida; employed collectors in Labrador, Newfoundland and in the southern states, thus acquiring a collection of some 10,000 skins and skulls, including the 100 or more types of the forms of the eastern land mammals that he had described. Between 1894 and 1899 he published about 70 papers in the field of systematic zoology, 55 of which were on mammals and the remainder on birds.

In 1898 he sent a collector to the Santa Marta region of Colombia, principally to collect mammals, but the few birds that were also sent back so aroused his enthusiasm that he gradually withdrew from the field of mammalogy and began to devote himself more and more to ornithology. In addition to building up his collection of North American birds, he or his friend, John E. Thayer, sent collectors to Panama, the Pearl Islands and Gorgona Island, Honduras, and the West Indies, as well as purchasing collections from various parts of Mexico, Costa Rica, Colombia, Surinam and Brazil.

In 1899, the Bangs collection of mammals was purchased for the Museum of Comparative Zoology, and at the same time Mr. Bangs was appointed assistant in mammalogy; in 1904, his title was changed to assistant in charge of mammals; in 1911, it was again changed to curator of mammals; in 1919, he became curator of mammals and birds; and, in 1924, he was finally successful in his efforts to be relieved of further responsibility for the mammal collection and became curator of birds.

In 1908 his splendid collection of birds, numbering about 24,000 skins, was presented to the museum. By this time he had definitely abandoned mammalogy, and while still nominally in charge of the mammal collection devoted himself exclusively to birds. His success in raising the small and inadequate bird collection he found on coming to Cambridge to a well-balanced collection of birds of the world, ranking among the three largest in this country, was in itself an achievement to be proud of, but when it is recalled that for many years he worked almost entirely without assistance, and single-handed kept the collection so beautifully arranged and systematically labelled that any specimen was instantly available, one becomes even more impressed with his genius and ability. Besides his routine and curatorial work, he felt a certain obligation to ornithologists throughout the world promptly to report on and to publish the results of the many important collections as they came in. His bibliography is a long one, consisting of several hundred titles, some of them papers of considerable length; in addition to describing about 100 forms of mammals, he is also the authority alone or jointly of nearly 400 species of birds.

Bangs's forceful and genuine personality was a large contributing factor to his success in building up the museum's collection; visitors and friends alike were impressed by his interest and enthusiasm, and on more than one occasion persons who sought his advice on hunting trips to foreign parts ended by taking a taxidermist with them in response to Bangs's persuasive powers. Always an active, vigorous man, it is strange that he never went on any extended collecting trips himself. With the exception of his field work in the South while engaged in the study of mammals, he made but one short visit to Jamaica in 1906, and this was cut short by an attack of dengue fever. He was, however, an inveterate hunter and fisherman, and until the onset of the first attack of a circulatory trouble, four years before the one that led to his death, he spent much time wading the icy trout streams of New England during the spring, and tramping the woods after partridges and woodcock in October and November.

By temperament he was philosophical and calm; changes he accepted without complaining; never hurried nor stampeded, he could sit down to a problem and think it out carefully and dispassionately and, aided by his inherent common sense, arrive at the logical answer. Anything savoring of ostentation was entirely foreign to his disposition; he never sought recognition, in fact went out of his way to avoid it; for this reason his professional honors are fewer than those of many a man of far less ability. He was awarded an honorary A.M. from his alma mater in 1918; he was a Foreign Member of the British Ornithologists Union and a Corresponding Member of the Deutsche Ornithologische Gesellschaft. He was a Fellow of the American Ornithologists Union, and a member of the Boston Society of Natural History, Nuttall Ornithological Club, Cooper Ornithological Club, New England Zoological Club,

Washington Academy of Sciences, Biological Society of Washington and the American Society of Mammalogists.

JAMES LEE PETERS

RECENT DEATHS

JOHN RIPLEY FREEMAN, consulting hydraulic engineer, of Providence, Rhode Island, died on October 6, aged seventy-seven years. Dr. Freeman was a member of the National Academy of Sciences and had been president of the American Societies of Civil and Mechanical Engineers.

ROBERT LEE FARIS, hydrographer and geodetic engineer, assistant director of the U. S. Coast and Geodetic Survey, died on October 5 at the age of sixty-four years.

DR. CYPRIEN O'DILLON MAILLOUX, of New York, consulting engineer, formerly editor of the *Electrical World,* died on October 5 at the age of seventy-one years. Dr Mailloux had been president of the American Institute of Electrical Engineers.

MONROE BENJAMIN SNYDER, who had served for many years on the faculty of Central High School, Philadelphia, and later had been engaged at the Franklin Institute in scientific research in physics, chemistry and astronomy, died on September 27. He was in his eighty-fifth year.

ADOLPH LOMB, vice-president of the Bausch and Lomb Optical Company and a son of the late Henry Lomb, cofounder of the firm, died on September 30. He was sixty-six years old.

MRS. MARCIA WOODARD ATWATER, widow of Professor W. O. Atwater, formerly professor of chemistry at Wesleyan University and head of the nutrition investigations of the United States Department of Agriculture, died on September 24 in Middletown, Connecticut, at the age of eighty-one years. She is survived by her daughter, Helen Woodard Atwater, editor of the *Journal of Home Economics,* and her son, Charles Woodard Atwater, of the law firm of Atwater and Clarke, New York City.

THE death is announced of Dr. William Stirling, Fullerian professor of physiology at the Royal Institution, London, at the age of eighty-one years. Dr. Stirling was formerly professor of physiology at Edinburgh.

PROFESSOR MAX WOLF, director of the Königstuhl Observatory at Heidelberg, died on October 3. He was sixty-nine years old.

SCIENTIFIC EVENTS

AMALGAMATION OF THE BRITISH PHYSICAL AND OPTICAL SOCIETIES

A PLAN for the amalgamation of the Physical Society of London and the Optical Society has been drawn up and unanimously recommended by a committee representative of the two societies. The combined societies will be named the Physical Society.

Nature says that it must be understood that the scheme is, as it states, an amalgamation—a fusion of the societies concerned. "In making a balanced estimate of the advantages accruing from such a fusion, it must be remembered that the circumstances in which the Optical Society was founded are scarcely germane to the present situation. However specialized its aims may have been in the earliest years of its existence, the Optical Society, as a glance at its *Transactions* will show, has developed into a general scientific body with an outlook scarcely to be distinguished from that of the Physical Society of London."

The article in *Nature* continues:

In some quarters a fear has been expressed that the fusion of the two societies will leave workers in applied optics without a forum in which to express their views. Nothing could be farther from the truth. Optical science is no longer confined to a narrow sphere of influence but has become the handmaid of all sciences, and optical instruments are now tools of industry. The amalgamation now completed is a visible sign of the union, to their mutual benefit, of the most representative body of producers of optical methods and instruments with the body which represents the largest and most important group of users of such methods and instruments. Under the auspices of the new Physical Society, the Guthrie lecture and the Thomas Young oration will be delivered as heretofore; papers on optical subjects have been a prominent feature in the *Proceedings of the Physical Society of London,* and their number will be materially increased under the new régime; arrangements for special lectures on topics of optical interest have been made, and the session now opening will be inaugurated by a lecture by Dr. J. W. French on "The Manufacture of Optical Glass"; and the probability of an increased output of papers is provided for by an increase of one part per annum in the number of published parts of the *Proceedings.*

THE EMPLOYMENT OF CHEMISTS

AT the Denver meeting of the American Chemical Society, the following statement was adopted as the sense of the council:

As it became manifest that the United States was involved in an economic depression which since has left no country untouched, the American Chemical Society increased its efforts on behalf of chemists not only in the

ways which it has always emphasized, but in new directions as well.

Industry was reminded of errors committed in previous days of stress through the discontinuance of scientific work and it is well known that industry generally has retained its technical men as long as possible, showing a better appreciation of research than in former times of similar financial discouragement. The importance of maintaining chemical personnel has been stressed through personal conversations, by a large volume of correspondence, in editorials, in addresses before business groups, and articles printed in business papers and magazines. The American Chemical Society News Service has conducted a wide campaign of publicity. Local sections have been encouraged to persuade industries in their areas to retain chemists already in their employ, while other industries had explained to them the desirability of giving chemists opportunities in their establishments. Among other results, some men have been placed in industries which heretofore have not learned the benefits to be derived from scientific research and control.

Members of the society were given increased space in the *News Edition* to announce their availability and industry was invited to make known its wants through the same medium. Placements have been made as a result. Local sections having employment committees increased their activities and have done excellent work resulting in the placement of a considerable number of chemists.

The office of the secretary of the society has devoted a large amount of effort in doing everything possible in a direct personal way toward relieving distress. Literally thousands of letters have been written to manufacturers, persistent attempts have been made to contact unemployed members and to secure details concerning them which would aid in their placement. Personal interviews have been had with many, and numerous efforts have been made in various ways, according to circumstances. While some positions have been secured, it must be realized that under present conditions it is well nigh impossible to create positions where no openings would have existed even in more favorable circumstances.

In all these and other efforts certain guiding principles have applied:

1. It is generally unavailing, improper and even prejudicial against a cause for a national organization to intrude in a municipal or state question.

2. Funds of the American Chemical Society are trust funds and can not be used legally for purposes for which they were not originally intended. Therefore the funds of the society have not been, nor can they be, used to support employment efforts, or to afford direct relief. Legal restrictions simply prevent it.

3. A man's first duty is to his family, and after that to his community. Similarly, the primary duty of the society is to help its own members, and after that to do whatever it can for non-member chemists.

4. Generally, relief is most effective where each locality can care for its own. Fortunately, the society has more than eighty local sections, each of which can function in a way best designed to meet its local problems in the most effective manner.

THE MARSHALL FIELD ZOOLOGICAL EXPEDITION TO CHINA

A CORRESPONDENT writes:

The Marshall Field Zoological Expedition to China has successfully completed its two years of scientific collecting in the interior of war-torn and flood-ravaged China, and its leader, Floyd T. Smith, of New York, is now in Shanghai preparing to send the final shipment of some 5,000 specimens to Field Museum of Natural History, and to return home himself. Several thousand specimens have been received at the museum in previous shipments from the expedition, which was financed by Marshall Field, of New York.

In his last report, Mr. Smith tells of the work of the final caravan he conducted into the Chinese interior during the past six months in the western provinces of Szechwan, Kweichow, Honan and Yunnan. While many difficulties were placed in the path of the expedition due to the political turmoil in China, all obstacles were overcome, and the expedition obtained one of the most remarkable collections of the fauna of the country ever made. Much was contributed to the success of the expedition by the cooperation extended by the Chinese Academy of Sciences at Nanking.

Of special interest among the collections are several fine specimens of the rare takin, curious goat-antelope of the mountains along the Tibetan border. This is a heavy-bodied animal with strangely shaped horns, and it looks like something belonging half-way between a chamois and a muskox. The specimens will be mounted at the museum in a group with a reproduction of their natural habitat.

The collections include, in addition to a number of other large mammals, thousands of small mammals and birds, and hundreds of fishes and reptiles. Previous shipments received at the museum contained many rare animals and some species entirely new to science.

Mr. Smith had a large number of natives in his party, including some qualified Chinese zoologists, and other Chinese whom he trained for scientific collecting. Thousands of miles were traversed with pack animals, afoot and by water in crude hand-propelled boats on the upper reaches of Chinese rivers. The expedition was frequently menaced by outlaws, and in one instance its camp was robbed and burned by wandering bandits. The expedition made, it is said, probably the most systematic zoological survey ever attempted in China, and at the height of its intensive collecting work Mr. Smith had seven separate camps in different localities working simultaneously, each in charge of a Chinese collector.

At all times Mr. Smith was the only white man on the expedition. He had been chosen to conduct the expedition because of long previous experience in China which especially qualified him for this work. During the two years the expedition was in the field not only banditry but natural catastrophes, such as raging floods

of the rivers, added to the perils, to say nothing of the ever-present danger of disease.

THE MYCOLOGICAL SOCIETY OF AMERICA

AT the last winter meeting of the Botanical Society of America, held at New Orleans, the Mycological Section formed a new society, the Mycological Society of America. The officers of the new organization are: *President,* W. H. Weston, Jr.; *Secretary-Treasurer,* H. M. Fitzpatrick, and *Councilors,* H. S. Jackson, C. R. Orton and Neil E. Stevens. The society will hold its first meeting at Atlantic City, on December 28, 29 and 30, in affiliation with the American Association for the Advancement of Science.

As the society was formed near the end of the New Orleans meeting, and many who were interested were not present, it is hoped that there will be a full attendance at Atlantic City. A business session will be held on Wednesday morning, December 28, at which it is expected that action will be taken on the proposal that *Mycologia* be adopted as the official organ of the society. A tentative contract has been drawn up between the officers of the society and the New York Botanical Garden, which will be offered to the society for its approval. By the terms of the contract the journal will continue to be published by the New York Botanical Garden, but the editorial policies will be controlled by the society.

Membership application blanks are being mailed to all members of the former mycological section of the Botanical Society of America, to all personal subscribers to *Mycologia,* and to other selected lists of names. All persons in America and abroad who are interested in mycology in any of its phases are invited to make application for charter membership. It is expected that the annual dues will not exceed five dollars, but this will be decided by vote of the society.

At Atlantic City in addition to consideration of business matters there will be a scientific program, with several sessions for the reading of papers. Those who wish to present papers will be provided on request with a blank form which must be filled in and returned not later than November 3 to the secretary-treasurer.

H. M. FITZPATRICK,
PLANT SCIENCE BUILDING,
CORNELL UNIVERSITY,
ITHACA, N. Y.

GEOLOGY AT THE ATLANTIC CITY MEETING

THE sessions of Section E (Geology and Geography) for the Atlantic City meeting of the American Association for the Advancement of Science will be held on Tuesday, December 27, in order to make no conflict with the annual meeting of the Geological Society of America which meets on Wednesday, December 28, in Cambridge. Tuesday morning will be devoted to the reading of general papers; abstracts and titles of papers for this program should be submitted to the secretary prior to November 15. Papers dealing with the geology and geography of the Atlantic Coastal Plain will be especially appropriate. The Tuesday afternoon session will be a symposium on "Late Pleistocene and Recent Changes of Level along the Atlantic Coast of North America," and among the speakers are H. A. Marmer (U. S. Coast and Geodetic Survey); Dr. C. Wythe Cooke (U. S. Geological Survey); Dr. Charles W. Townsend; Thomas C. Brown, Professor Wm. Fitch Cheney, Jr., Connecticut Agricultural College; Dr. Henry B. Kummel (State Geologist of New Jersey), and Professor Douglas Johnson, Columbia University.

The annual address of the retiring vice-president will be delivered at 4:00 P. M. by Professor Douglas Johnson, Columbia University, whose topic is announced as "The Rôle of Analysis in Scientific Investigation." A dinner for geologists and geographers at 6:30 P. M. will conclude the meeting of Section E. The Ritz-Carlton has been selected as general headquarters for Section E. Reservations should be made directly with the hotel management.

KIRTLEY F. MATHER,
Secretary

HARVARD UNIVERSITY,
CAMBRIDGE, MASSACHUSETTS

THE INSTITUTE OF ADVANCED STUDY AT PRINCETON

A MEETING of the board of trustees of the Institute for Advanced Study, founded by Mr. Louis Bamberger and Mrs. Felix Fuld, with Dr. Abraham Flexner as director, was held on October 10. Mr. Alanson B. Houghton presided. It has been decided to locate the institute in the vicinity of Princeton, New Jersey, and to begin active work in the autumn of 1933. The institute will consist of a series of schools, the first of which will be the School of Mathematics, the second, it is hoped, a School of Economics and History. Appointments were made as follows:

Professor Albert Einstein, of Berlin, was appointed professor of mathematical and theoretical physics. Professor Einstein will go to Princeton in the autumn of 1933 and will be in residence at the institute annually from October 1 to April 15.

Professor Oswald Veblen, until now professor of mathematics at Princeton University, was also appointed a professor at the School of Mathematics. Professor Veblen's connection with the institute began on October 1, 1932.

Dr. Walter Mayer, of Berlin, was made associate in mathematics and Dr. J. L. Vanderslice was appointed assistant to Professor Veblen.

Through the courtesy of the authorities of Princeton University the mathematical group will be temporarily accommodated at the new Fine Hall, which is peculiarly adapted to the purposes of an institute. On the other hand, the institute will be in every respect a separate organization, and, while it will cultivate cooperative and friendly relations with the members of the Princeton faculty, it is hoped that equally cooperative relations will be established with all similar groups throughout the country.

No definite site has yet been selected, nor has any step been taken in respect to buildings. The students admitted will be few in number and will be limited to persons who give promise of unusual development in their respective subjects.

SCIENTIFIC NOTES AND NEWS

AMONG the twelve physicians elected to foreign corresponding membership in the British Medical Association at the centenary meeting held in London from July 21 to 30, 1932, are the following Americans: Dr. Harvey Cushing, of the Harvard Medical School; Dr. Simon Flexner, of the Rockefeller Institute for Medical Research, and Dr. William H. Welch, of the Johns Hopkins University. The elections were made under a minute which reads: "Further to mark the importance of the centenary, the association is this year initiating a list of foreign corresponding members of the association. These members must be such as are, in the opinion of the science committee, distinguished by eminent services rendered to medical science or to the medical profession, and must not be eligible for ordinary membership of the association, or be British subjects, or be ordinarily resident in the British Dominions."

ELEVEN engineering societies have presented to Dr. David B. Steinman, president of the National Council of State Boards of Engineering Examiners, a sterling silver scroll "in recognition of his services which have contributed so greatly to advancing the status of the engineering profession." The presentation was made on September 29 at a dinner in the Hotel Pennsylvania, New York.

AT the last monthly meeting of the Royal Faculty of Physicians and Surgeons of Glasgow, Mr. Walter Hurst, having recently retired from the position of secretary, was presented by the president, Dr. R. Barclay Ness, on behalf of the fellows, with a mark of appreciation of his work. Mr. Hurst had been connected with the faculty for twenty-five years.

THE second Clausen gold medal "for outstanding services performed in behalf of the social and economic welfare work for the engineer," was awarded at the recent Washington meeting of the American Association of Engineers to Herman Alexander Wagner, of Chicago and Mayer, Arizona, who has devoted seven years as a director and officer of the association. He is the inventor of electrolytic processes for the treatment of refractory ores. Officers of the association elected at the meeting were: Victor Householder, *president;* Donald L. Chamberlin, *vice-president;* Mrs. M. E. McIver, *national secretary;* Howard Levering, of Huntington, West Virginia, and Victor Baum, of Tulsa, Oklahoma, *directors.* Members were received at the White House by President Hoover.

PROFESSOR LYMAN C. NEWELL, of Boston University, has been elected chairman of the division of chemical education of the American Chemical Society for 1932–33. He succeeds Professor John N. Swan, head of the Department of Chemistry in the University of Mississippi. Other officers chosen by the division are: *Vice-chairman,* Louis W. Mattern, instructor in chemistry, McKinley Technical High School, Washington, D. C.; *Secretary,* Professor R. A. Baker, College of the City of New York; *Treasurer,* Virginia Bartow, University of Illinois.

DR. R. E. DYER, of the U. S. Public Health Service, is in the U. S. Naval Hospital at Washington, suffering from an attack of typhus fever which was contracted in the course of his investigations on the disease in the laboratories of the U. S. National Institute of Public Health.

DR. HUGH P. BAKER, dean of the New York State College of Forestry at Syracuse, New York, has been elected president of the Massachusetts State College at Amherst. He succeeds Dr. Roscoe W. Thatcher, who resigned last spring on account of ill health.

AT the School of Medicine of the University of Texas, Dr. Donald Duncan, assistant professor of anatomy at the University of Buffalo, has been appointed associate professor of anatomy; Dr. Francis J. L. Blasingame will succeed Dr. Wilbur A. Sengelmann as instructor in anatomy; Dr. Wendell Gingrich will be professor of bacteriology and preventive medicine, and Dr. William M. Powell, instructor in pathology, succeeding Dr. Ellen D. Furey.

THE following men, who have recently received the doctorate in botany at the University of Nebraska, have entered upon new positions as indicated: Professor A. E. Holch, head of the department of botany,

University of Denver; Professor J. M. Winter, head of the department of biology, Peru State Teachers College, Nebraska; Professor T. L. Steiger, head of the department of biology, Sul Ross State Teachers College, Alpine, Texas; Professor W. E. Bruner, head of the department of biology, Kearney State Teachers College, Nebraska. Dr. Steiger has recently returned to the United States from a year and a half abroad, where he studied in Switzerland and France on a fellowship granted by the National Research Council.

DR. ALFRED ADLER, of Vienna, has been appointed head of the new department of medical psychology at the Long Island College of Medicine.

FLOYD S. YOUNG has been made director of the Lincoln Park Zoological Garden at Chicago, succeeding the late Alfred E. Parker, who died last August.

DR. CONSTANCE E. HARTT, who has been conducting research on potassium deficiency in sugar cane at the Experiment Station of the Hawaiian Sugar Planters' Association with the aid of the Sarah Berliner Research Fellowship of the American Association of University Women, has been enabled to continue research at the Experiment Station by the award of a fellowship by the Hawaiian Sugar Planters' Association.

THE Charles Mickle fellowship for 1932 has been awarded by the faculty of medicine of the University of Toronto to Dr. Gaston Leon Ramon, a graduate of the university, now director of the Pasteur Institute Farm at Garches, France. This award has been made to Dr. Ramon for his work on diphtheria and on practical methods for community protection against infectious disease.

ERNEST WILLIAM WIGNALL, formerly a fellow of the Rockefeller Institute for Medical Research, New York City, has been appointed secretary of the British Museums Association to succeed S. F. Markham.

PENELOPE JENKIN, of Newnham College, Cambridge, has been appointed Ray Lankester investigator at the Marine Biological Laboratory, Plymouth, for the year 1933. *Nature* states that Miss Jenkin will attempt to correlate the rate of photosynthesis of diatom cultures immersed at different depths in the sea, off Plymouth, with photoelectric measurements of light penetration made by Dr. W. R. G. Atkins.

W. F. HIGGINS, of the British National Physical Laboratory, has been appointed secretary of the laboratory in succession to F. J. Selby.

MLLE. M. CONDAT, who has held the post of *agrégé* since 1923, has recently been appointed professor of therapeutics in the medical faculty of Toulouse.

A. F. MOORE, of the Smithsonian Institution, and Mrs. Moore, who have been in Africa for twenty months investigating the suitability of sites for a solar observatory, have returned to Washington.

DR. W. W. ROBBINS, head of the Division of Botany at the Davis Branch of the College of Agriculture of the University of California, will spend six months in Europe where he plans to continue his investigations on sugar beets, weeds and seeds.

DR. HOWARD H. MARTIN, associate professor of geography at the University of Washington, has returned to Seattle after a year's leave of absence for field investigation in Europe and Northern Africa.

DR. H. C. CHANG, of the department of physiology of the Peiping Union Medical College, is visiting the United States.

DR. W. BAENSCH, professor of radiology at the University of Leipzig and director of the University X-ray and Radium Institute, is spending the month of October in the United States.

DR. CHARLES M. WALTHARD, of the department of neurology at the University of Zurich, has arrived in the United States to spend a year in visiting and studying neurological clinics and institutes.

ERIC REED, of the Rowett Institute, Aberdeen, Scotland, is spending six weeks in study in the nutrition laboratories of the animal husbandry division of the University of California, at the Davis Branch of the College of Agriculture.

THE Founder's Day address at Lehigh University on October 5 was delivered by Dr. W. F. G. Swann, director of the Bartol Research Foundation of the Franklin Institute, who spoke on "The Scientific Method."

A SERIES of five "Open Nights," beginning on October 14, will be held under the auspices of the Bond Astronomical Club at the Harvard College Observatory in Cambridge. On each evening a short non-technical talk will be followed, when the weather permits, by telescopic observation of celestial objects. There is no charge for admission, but tickets will be distributed only to the capacity of the lecture room. The lectures begin promptly at 7:30 P. M. The dates, titles and speakers for the lectures are: Oct. 14—"The Sun, a Variable Star," Dr. Donald H. Menzel. Oct. 18—"Our Galactic System," Dr. Bart J. Bok. Oct. 20—"Developments of the Telescope," Mr. William A. Calder, Jr. Oct. 25—"Eclipsing in 1932," Mr. Loring B. Andrews. Oct. 27—"The Pleiades and Milky Way Clusters," Dr. Carol Anger Rieke.

THE one hundred and eightieth regular meeting of the American Physical Society will be held at the

University of Chicago in the Ryerson Physical Laboratory on Friday and Saturday, November 25 and 26, 1932. Other meetings for the current season are as follows: Pasadena, December 16–17, Pacific Coast; Atlantic City, December 28–30, annual meeting; New York City, February 23–25, 1933; Washington, April 27–29; Pacific Coast, time and place to be announced, week of June 19.

BY the will of the late Daniel Pingree, who left an estate of $20,000,000, the sum of $700,000 is set aside for public purposes. The bequests include: Peabody Museum, of Salem, $10,000; Brown Library Association, Seabrook, N. H., $10,000; Town of Topsfield, $150,000 for a new library; Bates College, $150,000; Salem Public Library, $15,000; Salem Hospital, $10,000; Salem Y. M. C. A., $10,000, and Essex Institution of Salem, $10,000.

The British Medical Journal writes that with a view to encouraging the progress of clinical research on lines which the Medical Research Council has been developing in conjunction with University College Hospital Medical School since 1916, the Rockefeller Foundation has handed over to the corporation of University College Hospital the sum of £48,800 "to constitute a fund for the permanent endowment of a post the holder of which will devote his whole energies to the advancement of clinical research." It is planned to bring into existence a body of clinical workers, freed from ordinary hospital routine and teaching, who will devote their whole time to the investigation of special clinical problems. Since 1916 the Medical Research Council has financed such a body of workers under the guidance of Sir Thomas Lewis, at University College Hospital, and in 1930 the hospital formally recognized this group as a definite "department of clinical research." The gift of the Rockefeller Foundation will be used as an endowment for the post at present held by Sir Thomas Lewis, who is the pioneer of this development. It will release sufficient funds to enable the Medical Research Council to make provision for further posts of this nature, and thereby extend the work which it has begun.

DR. WILLIAM B. CADWALADER, president of the Zoological Society of Philadelphia, has addressed a letter to Mayor Moore to the effect that the Philadelphia Zoological Gardens, established fifty-six years ago, will be compelled to close unless the city grant an appropriation of $100,000 for the coming year. On account of the depression it would be impossible to sell the animals and it may be necessary to have them slaughtered.

THE dedication of the Louis Marshall Memorial, the new Science Building at the New York State College of Forestry, Syracuse, New York, has been postponed until February or March of next year. The dedication date was originally set for November 18. It is planned to invite the Governor of the State, the Secretary of the U. S. Department of Agriculture, the chief forester of the United States and deans of the forest schools as well as heads of organizations in the field of forestry.

DISCUSSION

EXPLORATION OF THE DEEP SEA

A RECORD deep sea dive has just been made in the course of the New York Zoological Society's 1932 Oceanographic Expedition to Bermuda. On September 22, from two to four P. M., Mr. Otis Barton and myself were submerged in the Bathysphere, eight miles off Nonsuch Island south of Bermuda. We reached an extreme depth of twenty-two hundred feet, or three hundred and sixty-six fathoms, and returned to the surface without mishap.

Every possible observation was made and recorded. Down to fourteen hundred feet—the record which we set in June, 1930—nothing extraordinary was noted. From seventeen hundred feet down the human eye could get no results either through the spectroscope or photometer, and the windows showed only intense blackness. An oblique upward glance revealed no paling, and the appearance on the surface of sudden brilliant sunshine reflected no discernible difference below. From here to twenty-two hundred feet and up again, the following interesting phenomena were observed: an unexpected abundance of fish, of large-sized crustacea and other invertebrates; the visibility of many by their own lights; the large size and complete lack of halation of the individual illuminants; the extreme clarity of observation; the sequence of abundance as regards color of lights, pale greenish, pale bluish and pale rosy; brightly illumined fish up to six feet in length; and finally, the swiftness of movement of all visible organisms except, of course, plankton. On account of an imperfect stuffing box and the increasing pitching and rolling we could not remain long at the greater depths, but there is no doubt whatever of the possibility of thorough visual resolving of the inhabitants of this half-mile zone when the observer can spend hours instead of minutes at the windows of the Bathysphere. Additional dives will be made next month.

WILLIAM BEEBE

OPPORTUNITY FOR PREVIOUS EXPOSURE BY CASES OF POLIOMYELITIS

UNTIL recently[1] epidemiologists have assumed that during an outbreak of poliomyelitis in a community, the virus is disseminated very widely and results in ready immunization. It ought to be interesting, therefore, to inquire whether positive cases of the disease have likely had previous occasions to become exposed. In Syracuse, outbreaks of poliomyelitis have occurred practically every other year in the decade from 1921 to 1930.[2] Upon the suggestion of Dr. George C. Ruhland, commissioner of health, such an investigation was carried out during the 1930 outbreak.

Since the largest previous epidemic occurred in 1924, children past their seventh birthday were investigated for this purpose. In the 1930 outbreak, there were 43 poliomyelitis patients 7 years old and over, and for 37 of these reliable information was obtained. Twenty-five had lived in the city the greater part of their lives or their entire lives. It was ascertained that they had been in the city during the summers when previous outbreaks had occurred. There were 2 individuals in the age group 10 to 19 who lived in Syracuse only the last 6 or 7 years. The remaining had been in Syracuse 3 years or less. One 7-year-old child was not in the city during the 1926 outbreak, but has lived here since. An eight-year-old had lived across the street from two children who had the disease in 1928. One of the adults was in Syracuse during the 1924 outbreak, but not since; another adult had not previously lived in Syracuse, but had lived in Utica all her life, where outbreaks have likewise occurred in 1921 and 1924. An even more striking instance in connection with this point is the family in which a girl, aged 6, had her onset on July 14 and died 5 days later. She remained at home the initial 4 days and during this time her brother, aged 5, was apparently exposed. He remained well, however; but two months later, actually on September 21, had his onset of a paralytic attack. Similarly, there was an instance of a child of 7 whose brother had had the disease in 1926, and both remained at home, yet he escaped at that time but did come down in the 1930 outbreak.

It is true, of course, that even in measles and chickenpox with their extremely high secondary attack rates, occasional instances are found in which a sibling escapes the disease despite home contact with a brother or sister, only to come down at a later time. Except when exposure results in an attack there is usually no way of telling when contact has produced effective exposure. Moreover, the factors in susceptibility or resistance to poliomyelitis are still to be elucidated.

A. CLEMENT SILVERMAN

COLLEGE OF MEDICINE
SYRACUSE UNIVERSITY

[1] S. D. Kramer and W. L. Aycock, Proc. Soc. Exp. Biol. and Med., 29, 98–99, 1931.
[2] A. C. Silverman, *Am. Jour. Dis. Ch.*, 41, 829–861, 1931.

THE ISOLATION OF HEXURONIC ACID[1]

THE methods of Szent-Györgyi[2] and of Grettie and King,[3] Svirbely and King,[4] and Smith and King,[5] and Waugh and King,[6] have been tried for the isolation of hexuronic acid from orange juice. The method of Szent-Györgyi was found to be extremely complicated and fraught with difficulties. Better results were obtained by the less troublesome methods proposed by King and his coworkers.

The following difficulties were encountered, however, which require emphasis and should be brought to the attention of others working in this field.

The lead acetate used should be free from traces of copper, as this metal catalyzes the oxidation of the hexuronic acid.

When orange juice was fermented, metabolic products of the yeast were introduced which were carried through with the hexuronic acid. Thus succinic acid was formed which melts at about the same temperature as the hexuronic acid and forms needle-like crystals in the final preparation. In later experiments on unfermented juice, this difficulty was not encountered.

Finally, working in the humid climate of Washington, much trouble was had with the condensation of moisture. The hexuronic acid appears to be quite hygroscopic, and to achieve the best results absolutely dry reagents and a dry room in which to work are necessary. The exclusion of air by keeping the preparation in a vacuum or in an inert gas is also necessary.

E. K. NELSON

[1] Food Research Division Contribution No. 163, Bureau of Chemistry and Soils, U. S. Department of Agriculture.
[2] Albert Szent-Györgyi, *Biochem. Jour.*, 22, 1387–1409, 1928.
[3] Grettie and King, *Jour. Biol. Chem.*, 84, 771–6, 1929.
[4] Svirbely and King, *Jour. Biol. Chem.*, 94, 483–90, 1931.
[5] Smith and King, *Jour. Biol. Chem.*, 94, 491–6, 1931.
[6] Waugh and King, *Jour. Biol. Chem.*, 97, 225–31, 1932.

CORDYLOPHORA IN MASSACHUSETTS

ON September 11, I took a colony of the freshwater hydroid, *Cordylophora lacustris* Allman, under circumstances which seem worthy of record. This colony was attached about the umbilicus of a living snail, *Planorbis trivolvis*, and consisted of a dozen or so small individuals without gonosomes. The specimen came from the Charles River at Gerry's Landing, Cambridge. This is 4.4 miles above the dam at

the mouth of the river, but at the present time the chloride in the water is equivalent to .224 per cent. NaCl. Associated with the above animals were the decapods, *Palaemonetes vulgaris* and *Rhithropanopeus harrisi*, which ordinarily occur in salt or quite brackish water. While this occurrence of *Cordylophora* is rather similar to those described in the Biological Survey of the Woods Hole Region, it also raises the question as to the exact conditions under which the animal occurs in the interior states from which it has been several times reported.

CHARLES H. BLAKE
DEPARTMENT OF BIOLOGY AND PUBLIC HEALTH
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SCIENTIFIC MEETINGS

THIRTEENTH ANNUAL MEETING OF THE AMERICAN GEOPHYSICAL UNION

THE thirteenth annual assembly of the American Geophysical Union and of the meetings of its sections on April 28 and 29, 1932, was held at Washington, D. C., in the building of the National Academy of Sciences and National Research Council, except for two of the three meetings of the Section of Hydrology, which were held in the conference room of the Geological Survey in the building of the Department of the Interior.

The individual section meetings were marked by numerous progress reports on geophysical activities, not only in the United States, but also in Canada and in Mexico. The Section of Geodesy, following such progress reports, discussed gravity work, isostasy, instrumental developments, the moon's influence on latitude and aerial photogrammetry.

In the Section of Seismology the meeting was given over to a "Symposium on the Application of Seismology to the Study of Ocean-Basins."

In the Section of Meteorology accounts of the programs arranged for the Second International Polar Year of 1932–1933 and for the solar eclipse of August 31, 1932, were followed by papers bearing on winds in the upper atmosphere and in the antarctic, on atmospheric turbidity and water-vapor, on interrelations between air- and ocean-temperatures in California and the northeast Pacific, on weather-charts of the northern hemisphere and on a half century of American rainfall.

In the Section of Terrestrial Magnetism and Electricity the reports of 17 organizations regarding American activities in its fields during the past year were followed by papers relating to ionization of the upper atmosphere, its radio exploration and geophysical significance, to conducting-layer measurements at Little America, to periodicities in radio-transmission phenomena, to cosmic radio correlations, to slow-moving ions of the atmosphere, to lightning discharges and the electrical fields of thunder-storms and to instrumental progress.

The communications to the Section of Oceanography, besides progress reports showing the development of oceanographical work in the United States by governmental and private organizations, included discussions of light penetration into the sea, of formation of submarine valleys, of oceanic surveys of temperatures and the temperature gradients in oceanic waters, of Arctic and Atlantic interchanges, of radium content of ocean-bottom sediments, of microbiology and marine limestone and of oceanographic centers and methods of northwest Europe.

In the Section of Volcanology the papers dealt with Central American volcanoes in 1932, with volcanic developments in 1931–32 and with volatility of silica with steam.

The Section of Hydrology devoted the morning, afternoon and evening of April 28 to hearing reports of its nine permanent committees and 21 papers submitted by authors from federal governmental, state governmental, university and consulting engineering organizations. These covered numerous investigations and developments in scientific hydrology throughout the United States. They serve also to illustrate how wide-spread and how effective is the cooperation of American hydrologists.

At the business meeting which preceded the scientific session of the general assembly of the Union on April 29, 1932, the general secretary reported a total membership of 274 as of the date of May 1, 1932. This report gave some account of the relations of the union with the International Union of Geodesy and Geophysics and of the bearings of the union's activities in international geophysical expeditions as, for example, the International Scientific Expedition to the Bahamas during February and March, 1932, and the Arctic Expedition of the *Graf Zeppelin* in July, 1931.

The following resolutions, as proposed by the union and by its several sections, were unanimously approved:

(*I*) *Resolution on the Urgent Need of Continuing Oceanographic Work without Material Curtailment*

(Proposed by General Assembly)

Whereas, The great value of the oceanographic survey work conducted by various bureaus of the Government is universally recognized, and

Whereas, Any appreciable curtailment of this work would result in a real loss to geophysics from both practical and theoretical points of view, therefore be it

Resolved, That the American Geophysical Union hereby expresses its appreciation of the value of the oceanographic work conducted by various bureaus of the Government, and be it further

Resolved, That it urges, in accommodating governmental activities to necessarily reduced budgets, there should be no disproportionate curtailment in appropriations devoted to this part of the Government's service, and be it further

Resolved, That copies of this resolution be sent to the President of the United States, to the Secretary of Commerce, to the Secretary of the Navy, and to the Secretary of the Treasury.

(II) *Resolution on Gravity Work at Sea by United States Navy*

(Proposed by Section of Geodesy)

Whereas, Results of great scientific value have been obtained by observations of gravity at sea in the waters of the West Indies and adjacent regions by the two expeditions of the United States Navy, the first in 1928 and the second in 1932, and

Whereas, Satisfactory determinations of gravity at sea can be obtained only on board of a submerged submarine, therefore be it

Resolved, That the American Geophysical Union of the National Research Council expresses its high appreciation to the United States Navy Department for its contribution to science in making available submarines for the important work of determining gravity at sea and its hearty thanks to the officers and crews of these submarines for their able and ready cooperation, and be it further

Resolved, That the American Geophysical Union expresses the hope that the United States Navy will continue to contribute to this important scientific work by placing, whenever practicable, a submarine at the disposal of properly equipped observers desiring to undertake work of this sort, either in the waters adjacent to the United States or in mid-ocean, and be it further

Resolved, That copies of this resolution be sent to the President of the United States and to the Secretary of the United States Navy.

(III) *Resolution Regarding the Purchase of Apparatus for Determining Gravity at Sea*

(Proposed by Section of Geodesy)

Whereas, The determination of gravity at sea has long been recognized by scientific men as a means of discovering geophysical and geological facts of great value and importance in ocean areas, and

Whereas, The determination of gravity at sea with an accuracy approaching that attainable on land has repeatedly been proved to be possible, if carried out with a suitable multiple-pendulum apparatus on board a submarine, and has again been demonstrated by the observations aboard the U. S. submarine S-48, on the recent expedition to the waters of the West Indies during February and March, 1932, and

Whereas, The results of the several gravity-at-sea expeditions, on which the special multiple-pendulum apparatus has been used, have confirmed the high expectations of the scientific public, therefore be it

Resolved, That the American Geophysical Union of the National Research Council expresses the hope that an apparatus of the multiple-pendulum type may soon be secured by some organization or institution in this country, for use on submarines of our Navy, and be it further

Resolved, That copies of this resolution be sent to the President of the United States, to the Secretary of the United States Navy, and be distributed otherwise as, in the opinion of the Chairman of the National Research Council, may seem expedient.

(IV) *Resolution on Naval Observatory Time-Signals*

(Proposed by Sections of Geodesy and of Seismology)

Whereas, Organizations represented in several sections of the American Geophysical Union have benefited by the increase in the number of standard time-signals broadcast daily by the United States Navy during the past year, therefore be it

Resolved, That the American Geophysical Union expresses its hearty appreciation of the action of the United States Navy, especially the U. S. Naval Observatory and the Naval Communications Service, in furnishing this valuable time-service, and be it further

Resolved, That the United States Navy be requested to increase still further, if possible, the number of daily signals when conditions permit it to do so, and be it further

Resolved, That copies of this resolution be sent to the Secretary of the Navy, to the Superintendent of the U. S. Naval Observatory, and to the Director of Naval Communications.

(V) *Resolution on the Need of Non-Governmental Research Institutions in Meteorology*

(Proposed by Section of Meteorology)

Whereas, Urgent need exists for the training of students in advanced meteorological work, and

Whereas, Incident to the development of aviation and other lines of commercial activity, greater need exists than heretofore for the services of trained meteorologists, and corresponding opportunities for employment arise in civil and governmental departments, therefore be it

Resolved, That the American Geophysical Union expresses the hope that colleges and other educational institutions will provide for courses in advanced meteorology, and be it also

Resolved, That the Union specifically indorses the progress that has already been made along this line by the Massachusetts Institute of Technology, and urges the need for its continuance and ample support, and be it further

Resolved, That a copy of this resolution be sent to the President of the Massachusetts Institute of Technology.

(VI) Resolution in Commendation of Geophysical Abstracts, Published as an Information Circular of the U. S. Bureau of Mines

(Proposed by Section of Terrestrial Magnetism and Electricity)

Whereas, The growth of interest in geophysics in recent years both from the practical and from the basic point of view has been very rapid, the extensive and increasing literature on this subject being scattered about in a large number of journals, and

Whereas, The *Geophysical Abstracts* compiled and published by the U. S. Bureau of Mines is supplying an important need by providing a helpful review and directory of the literature of geophysics, therefore be it

Resolved, That the American Geophysical Union hereby commends this undertaking and expresses its hope that the compilation and publication of the *Geophysical Abstracts* may be continued and extended, if possible, and be it further

Resolved, That a copy of this resolution be sent to the Director of the U. S. Bureau of Mines.

(VII) Second International Polar Year 1932–33

(Proposed by Section of Oceanography)

Whereas, During the Second International Polar Year 1932–33 various meteorological, magnetic, and hydrographical observations are to be made simultaneously in many widely separated regions by organizations representing various countries, and

Whereas, The United States Coast Guard has, in connection with the International Ice-Patrol Service and the *Marion* Expedition, obtained much valuable scientific data in the region of the Grand Bank and Davis Strait, and has the physical equipment and personnel suitable for continuing this work, therefore be it

Resolved, That the American Geophysical Union expresses its high appreciation of this work and its hope that the United States Coast Guard will find it possible to undertake further determinations during the Second International Polar Year of the interchange of water between the Arctic and Atlantic Oceans in the region of the Grand Bank and Davis Strait, and incidentally make such meteorological and magnetic observations as may be practical, and be it further

Resolved, That a copy of this resolution be sent to the President of the United States, to the Secretary of the Treasury, to Admiral F. C. Billard, Commandant of the United States Coast Guard, and to Dr. D. la Cour, President of the International Commission of the Polar Year 1932–33.

(VIII) Resolution on the Death of Alfred Judson Henry

(Proposed by Section of Meteorology)

Whereas, The death of Alfred Judson Henry has removed from the American Geophysical Union a member who has taken a particularly active part in its organization, especially in the organization of its Section of Meteorology, which he served as Secretary and in many other ways, and

Whereas, He rendered conspicuous service to geophysics through a series of notable contributions, particularly in climatology, forecasting, and the relations between weather and floods, therefore be it

Resolved, That the American Geophysical Union records its sense of great loss in the death of Alfred Judson Henry, not only because of his scientific attainments but also because of his fine personal qualities, and be it further

Resolved, That a copy of this resolution be sent to Mrs. Henry.

(IX) Resolution on the Death of Robert DeCourcy Ward

(Proposed by Section of Meteorology)

Whereas, In the death of Robert DeCourcy Ward, the American Geophysical Union has lost a member who, as a pioneer in the teaching of climatology and as an author of several outstanding authoritative works in this subject, particularly "The Climates of the United States," has contributed notably to geophysical science, and

Whereas, Professor Ward was possessed of a particularly attractive personality and a high sense of honor and right, therefore be it

Resolved, That the American Geophysical Union expresses its sense of profound sorrow on the loss of Robert DeCourcy Ward, distinguished scientist and splendid citizen, and be it further

Resolved, That copies of this resolution be sent to Professor Ward's family and to the President of Harvard University.

(X) Resolution on the Death of Louis Agricola Bauer

(Proposed by Section of Terrestrial Magnetism and Electricity)

Whereas, The American Geophysical Union has learned with profound regret of the death of Louis Agricola Bauer, founder and late director emeritus of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, and mindful of the active interest which he has taken in the affairs of the Union and of the important services he has rendered in the advancement of geophysics, particularly in the initiation and conduct of a magnetic survey of the earth and in the analysis of the results thus obtained, therefore be it

Resolved, That the American Geophysical Union, in general meeting assembled, records this expression of its sense of loss in the death of Louis Agricola Bauer, and be it further

Resolved, That copies of this resolution be sent to Dr. Bauer's family, to the President of the Carnegie Institution of Washington, and to the Acting Director of the Department of Terrestrial Magnetism.

W. J. Humphreys was elected chairman and Austin H. Clark vice-chairman of the union, both for the period 1932 to 1935, J. A. Fleming continuing as general secretary, his term expiring in 1934. Officers of the various sections were elected as follows to serve for the period 1932–1935:

GEODESY: *Chairman*, Henry G. Avers; *vice-chairman*, Donald C. Barton (C. H. Swick's term as secretary expires in 1934).

SEISMOLOGY: *Chairman*, Frank Wenner; *vice-chairman*, F. W. Lee (H. E. McComb's term as secretary expires in 1933).

METEOROLOGY: *Chairman*, W. R. Gregg; *vice-chairman*, C. F. Brooks; *secretary*, O. H. Gish.

TERRESTRIAL MAGNETISM AND ELECTRICITY: *Chairman*, J. A. Fleming; *vice-chairman*, Seth B. Nicholson; *secretary*, E. O. Hulburt.

OCEANOGRAPHY: *Chairman*, H. B. Bigelow; *vice-chairman*, H. A. Marmer; *secretary*, C. O. Iselin.

VOLCANOLOGY: *Chairman*, N. L. Bowen; *vice-chairman*, E. S. Larsen; *secretary*, R. E. Gibson.

HYDROLOGY: In this section O. E. Meinzer, R. E. Horton and H. N. Eaton continue as chairman, vice-chairman and secretary, respectively, their terms all expiring in 1933.

The scientific session following the business matters was devoted to a symposium on the application of geophysics to ocean basins and margins, and included the following papers:

(a) Introduction, by Richard M. Field.

(b) "Problems of Island Arcs and Ocean Deeps," by Walter H. Bucher.

(c) "The Structure of the Bartlett Trough," by Stephen Taber.

(d) "Seismic Zones as Related to Relief of Ocean Bottom," by N. H. Heck.

(e) "Interpretation of Gravity Anomalies and Sounding Profiles Obtained in the West Indies by the International Expedition to the West Indies in 1932," by Harry Hammond Hess.

(f) "Sounding the Depths of the Ocean for Mapping the Conformation and Topography of the Bottom," by G. W. Littlehales.

(g) "The Applications of Seismic Methods to Submarine Geology," by E. DeGolyer.

(h) "Torsion-balance Surveys in Southwest Louisiana and Southeast Texas," by D. C. Barton.

(i) "Experiences of a Seismologist with 'Seismic Methods,'" by A. L. Day.

The reading of the papers was followed by an illuminating discussion with constructive comments, emphasizing particularly the close relationships holding between geological and geophysical investigations.

The communications from members of the national committees of our neighbors in Canada and Mexico showed continued active international cooperation between those countries and the United States, and reported on the progress of governmental activities and on results of geophysical researches stimulated by the national committees.

The success attending the meetings in 1932 was the result largely of the careful and thoughtful development of the program and arrangements made by the committee on meetings of the union, consisting of Messrs. Frank Wenner (*chairman*), R. M. Field, R. E. Gibson, H. A. Marmer and F. W. Sohon, S.J. The union is particularly indebted to Professor R. M. Field, who suggested and arranged for the speakers in the symposium on the application of geophysics to ocean basins and margins. The large attendance and constructive discussions during the general assembly of the union and the meetings of its sections afforded material evidence of the rapidly expanding interest in geophysics in America.

The complete *Transactions* of the thirteenth annual meeting of the union, involving 85 papers in addition to progress reports submitted by various organizations interested in geophysical work and including the annual reports of eight permanent committees of the Section of Hydrology, were assembled, edited and published by the general secretary of the union as a special publication of the National Research Council. This volume of 401 pages came from the press in the first week of July, thus only a little more than two months after the meeting. Over fourteen hundred copies of the volume were distributed in the United States and abroad by the middle of July. This prompt publication and distribution was made possible by planographing the manuscripts and illustrations.

JNO. A. FLEMING,
General Secretary

SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE USE OF "NEMBUTAL" AS AN ANESTHETIC FOR MICE

SODIUM Ethyl (1 Methyl Butyl) Barbiturate, trade name "Nembutal," is being used quite extensively as an anesthetic in veterinary practice. We have recently tried it on mice, and found it to be quite satisfactory. It is easily administered by injecting into the peritoneal cavity with a fine hypodermic syringe. It has decided advantages over ether or other gaseous anesthetics. Our experience shows that dosages sufficient to anesthetize for a period of up to one hour are perfectly safe. In fact, single doses, large enough to anesthetize for three to four hours, seldom result in death. Repeated doses may be safely administered, prolonging the hypnotic effect over a period of six or eight hours, with entirely satisfactory results.

Similar doses may produce a considerable difference in the time of hypnosis even in the same mouse at different times, depending probably on the condition

of the mouse, amount of food in the digestive system, etc. These conditions seemed to have more effect on the time than the size or weight of the animal. Mice weighing between 15 to 20 grams seemed to react about the same; above 20 grams, a slightly larger dose is required; the sex of the mouse apparently makes no difference, males and females reacting similarly. So far, in our experience we have found no adverse after-effects from the use of this drug.

The concentration of the solution recommended by the manufacturers has been found, for practical purposes, to be a little too great. It is much easier to administer accurately a less concentrated solution; and this is quite an item when a very small excess of a highly concentrated solution will cause death. The most satisfactory solutions were found to be 1 grain Nembutal dissolved in 5 cc or 10 cc of water, and of these two, the writer prefers the latter as being a little more convenient for accuracy.

The peripheral nerves apparently react to Nembutal more slowly than the central nerves. This drug will, however, produce complete anesthesia in mice in from 3 to 15 minutes, depending on the amount given. The following table gives the dosage, average time to anesthetize and average recovery time, as experienced in this laboratory. The time limits given in the table represent conditions both when the administering of the drug was, and when it was not followed by an operation (such as vasectomy).

Nembutal	Weight	Anesthetized	Recovery	Lethal
1/16 gr.	15–20 gm.	2– 4 min.	None	15–15 min.
1/25 gr.	15–20 gm.	6– 8 min.	3½– 6 hrs.	1 death in 67 min.
1/33 gr.	15–20 gm.	6–10 min.	50–80 min.	
1/40 gr.	15–20 gm.	6–10 min.	45–90 min.	
1/50 gr.	15–20 gm.	8–12 min.	40–70 min.	
1/66 gr.	15–20 gm.	8–15 min.	10–25 min.	
1/100 gr.	15–20 gm.	Partial		
1/100 gr.	Repeated	10–15 min.	50–120 min.	

Dosages of 1/20 gr. and over are generally lethal in mice weighing less than 20 grams; larger dosages than this result in death in a few minutes preceded by convulsions. For average purposes, the most satisfactory dosage is 1/50 grain dissolved in .2 cc of water and administered intraperitoneally. Since respiration is lowered by the administering of the drug, and at times it is quite slow, it might be necessary under cooler climatic conditions to take precautions to keep the mouse warm, especially after an operation; in our laboratories, however, we have not found this necessary.

There is considerable satisfaction in the use of Nembutal for anesthesia in mice: the results are prolonged, there is no need of watching the anesthetic, there are no after-effects, and death seldom results where normal dosages are administered. We have not recorded a single death in hundreds of cases where the dosage did not exceed 1/50 grain.

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AN EFFICIENT MEDIUM FOR REARING HOUSEFLIES THROUGHOUT THE YEAR

THE rearing of houseflies (*Musca domestica* L.) throughout the year for use in various lines of research has developed largely in the last decade. Bacteriological, biological and more especially insecticidal studies have made the need urgently felt for the rearing of houseflies, even during the winter months. Glaser[1, 2] (in 1923 and 1924) reported on his trials for rearing flies throughout the year. He was able to breed flies from the middle of April to the middle of December, but it was not found possible to rear them on his culture medium (fresh horse manure) during the remainder of the year. Further studies (1927)[3] showed that the addition of small amounts of a bakery yeast suspension made possible the rearing of flies throughout the year. Fresh horse manure was found to be deficient in this respect during the winter months of the year. Grady (1928)[4] developed the technique of rearing large numbers of flies for daily insecticidal tests, and by the use of Glaser's method he was able to rear flies continuously throughout the year. Hockenyos (1931)[5] found that by the addition of hog manure to horse manure (1 part of the former to 3 or 4 parts of the latter) with yeast as a supplemental food, he could produce a more satisfactory medium for breeding houseflies than with horse manure alone. More nutriment per unit for the larvae was apparently provided by this mixture.

The use of horse manure, or mixtures of it with hog manure, as a rearing medium has several distinct disadvantages. For one, it is not always available to most laboratories. Then, too, it is rather disagreeable to handle. Most important, however, is the fact that frequently a species of red mite, parasitic on the housefly, is brought in on horse manure. This mite attacks the adult housefly on the underside of the thorax and abdomen between the segments, and also between the coxae of the legs, as well as at the place of attachment of the wings. Five to 40 or more mites are sometimes found on one housefly, and of course the presence of these mites precludes the use of such

1 *Jour. Exp. Zool.*, 38, 383–412, 1923.
2 *Jour. Econ. Ent.*, 17, 486–96, 1924.
3 *Jour. Econ. Ent.*, 20, 432–33, 1927.
4 *Jour. Econ. Ent.*, 21, 598–604, 1928.
5 *Jour. Econ. Ent.*, 24, 717–725, 1931.

parasitized flies for insecticidal tests. Once this mite is established, it is exceedingly difficult to eradicate. Thorough treatment with steam of all apparatus and media is necessary, and one is forced to start entirely new cultures.

In studies made for the rearing of large numbers of houseflies continuously throughout the year, it was found that a wheat bran-alfalfa meal mixture, supplemented with small amounts of yeast and diamalt (a commercial product composed of a large percentage of malt sugar) provided a very satisfactory larval medium. The materials that make up this rearing medium are readily available to any laboratory. They are clean and easy to handle. Most important, no parasitic mites are present on them. Furthermore, it appeared that this medium contained more nutriment per unit than a horse manure medium, and with it, larger numbers of flies could be reared. The formula which was found most satisfactory is given as follows:

Wheat bran	3½ lbs.	Mix thoroughly
Alfalfa meal	1¾ lbs.	
Water	5000 cc	Mix thoroughly together
Yeast suspension (prepared from 1 lb. baker's yeast to 2 liters of water. This stock suspension should be kept on ice and used as needed)	300 cc	
Diamalt (a product of the Fleischmann Yeast Co., containing a large percentage of malt sugar)	25 cc	

Add the water mixture to the bran mixture and stir thoroughly. The housefly eggs may be added immediately. The quantity of yeast suspension necessary can probably be lessened considerably by preparing the entire mixture one day before use, so that the yeast cells will have time to multiply. Flies are attracted to and readily oviposit on this medium and small amounts of it can be used in the breeding cages for this purpose. The housefly eggs can then be added to the larval mixture, and the jars containing it can be incubated at 90° F. Fresh diluted milk appeared to be a satisfactory food for the adult houseflies.

With this larval medium houseflies in large numbers have been successfully reared at Ames, Iowa, throughout the year. During the winter of 1931 and 1932, F. L. Campbell and Sullivan, of the U. S. Bureau of Entomology at Washington, D. C., have used it with very good results.

This note represents part of the author's doctorate thesis at Iowa State College. The author wishes to acknowledge with thanks the advice of Dr. C. H. Richardson, Dr. R. W. Glaser and Mr. A. G. Grady during the progress of this research. The funds supporting this work were provided by the Deep Rock Oil Corporation and were administered as a Crop Protection Institute project. The author is now located with the U. S. Department of Agriculture, Washington, D. C.

HENRY H. RICHARDSON

IOWA STATE COLLEGE

SPECIAL ARTICLES

NOTE ON THE GROUP SPECIFIC SUBSTANCE OF HORSE SALIVA

IN previous work on the so-called Forssman hapten, active fractions were prepared from alcoholic extracts of horse kidney which were richer in carbohydrate than the known cerebrosides, thus suggesting that the specificity of the substance may be due to carbohydrate groupings[1] (not improbably in a combination with lipoids). Evidence pointing in the same direction was afforded by investigations[2] on the Forssman substance of bacilli which behaves similarly to, and could not be separated from the precipitable substance consisting largely of carbohydrates. Closely related to these investigations are those on the human group substance A whose relationship to the Forssman substance has been demonstrated by Schiff.[3] From human serum of group A individuals, Brahn and Schiff[4] obtained a serologically active preparation, which on hydrolysis yielded sugar, and quite recently Freudenberg, Eichel and Dirscherl[5] reported briefly on an active substance from the same source, of an elementary composition resembling that of a polysaccharide, and strongly reducing Fehling's solution after hydrolysis.

Continuing the studies quoted above, horse saliva was investigated, which, as Schiff[4] has shown, reacts with immune sera specific for the human group substance A. In these preliminary experiments an active

[1] Landsteiner and Levene, *Jour. Immunol.*, 14, 81.

[2] Brahn and Schiff, *Deut. Med. Wschr.*, 1930, p. 1207; Kurt Meyer, *Ztschr. Immunitätsf.*, 68, 69; Landsteiner and Levine, *Jour. Immunol.*, 22, 75.

[3] *Kl. Wschr.*, 1924, 679; Schiff and Adelsberger, *Ztschr. Immunitätsf.*, 40, 335.

[4] "Ueber die gruppenspezifischen Substanzen," etc., Jena, G. Fischer, 1931, p. 102. Another substance reacting with anti A immune sera and rich in carbohydrate was found by these authors in commercial pepsin (*Kl. Wschr.*, 1932, p. 1592).

[5] *Naturwiss.*, 1932, p. 658.

preparation was obtained by treatment with acid and acetone and fractionation with alcohol, which gave only a weak biuret reaction and on hydrolysis yielded 48.5 per cent. reducing sugar (calculated as glucose). Another preparation made in a different way from saliva adsorbed with kaolin and charcoal, reacting strongly with anti A immune sera, had the composition C, 44.65 per cent.; H, 6.76 per cent.; N, 7.43 per cent. (calc. for ashfree substance; ash 3.37 per cent). It is intended to describe the results later in detail.

Although it can not be claimed that any group specific substance isolated so far is a chemical individual, and in spite of differences in their immunological behavior from that of bacterial polysaccharides, it would seem probable from the foregoing data that the group substance A owes its peculiarity to carbohydrate groupings. Taking into account its relationship to other non-protein substances specific for species or organs, one is led to think that carbohydrates may play a rôle in the specificity of materials of animal origin comparable to their significance for the specificity of bacilli, as demonstrated by Heidelberger and Avery.

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THE PRESENCE OF COMPOUND CHROMOSOMES IN THE PRIMARY SPERMATOCYTES OF CIRCOTETTIX VERRUCULATUS (ORTHOPTERA)

THE hypothesis of segmental interchange[1] is based upon the assumption that homologous elements attract each other at synapsis. If an interchange of parts between two non-homologous chromosomes should occur in the spermatogonia the resulting attraction at synapsis should bring about the union of chromosomes which are not wholly homologous. The chromosomes involved in such an interchange should appear as multiples or rings in the first maturation division. Multiples of this nature are commonly found in the primary spermatocytes of *Circotettix verruculatus* after irradiation with x-rays.

In all irradiated individuals there are some cysts containing first spermatocytes in which the chromosome structure seems to be unmodified as well as other cysts whose cells contain multiples or rings formed as a result of a translocation occurring in the spermatogonia. Since it is known that all the cells within a single cyst are the descendants of one spermatogonium, the presence of the same multiple in all the cells would be expected. All individuals, however, whose spermatocytes show multiple chromosomes

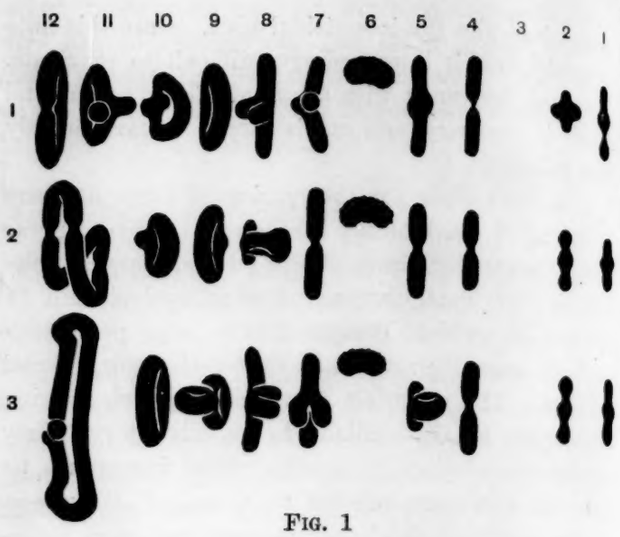

FIG. 1

have the normal spermatogonial number of twenty-one.

The drawings were made from the primary spermatocytes of a single individual which had been irradiated before hatching. The chromosomes figured in the first row are from a cell which seemed to have been unaffected by the irradiation and, therefore, represents the normal condition for this animal.[2] The multiples or rings formed as a result of a reciprocal translocation are shown in the second and third rows. This interchange of parts between one of the homologues of chromosome eleven and that of chromosome twelve has resulted in the formation of a closed ring similar to those found in Oenothera. The configuration of the ring in the second row is such that the segregation of the homologous elements would be complete; whereas, in the ring figured in the third row the structure is such that segregation would be only partial.

Many different multiple chromosome forms are found, but the translocations involved in their formation are so complex that a description of them will be reserved for a more complete paper on the effects of x-rays upon the germ cells of *Circotettix verruculatus*.

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BOOKS RECEIVED

MILLER, DAYTON C. *Laboratory Physics.* Second edition. Pp. xviii + 438. 197 figures. Ginn. $3.00.

PARKS, GEORGE S. and HUGH M. HUFFMAN. *The Free Energies of Some Organic Compounds.* Pp. 251. 16 figures. Chemical Catalog Company. $4.50.

SHORR, PHILIP. *Science and Superstition in the Eighteenth Century.* Pp. 82. Columbia University Press. $1.50.

[1] J. Belling, *Jour. Genetics*, 18: 177–205, 1927; J. Belling and A. F. Blakeslee, Proc. Nat. Acad. Sci., 12: 7–11. 1924.

[2] For a more complete description of the chromosomal conditions in *Circotettix verruculatus* see a previous paper by the same author in *Jour. Morph. and Physiol.*, 47: 1–36.